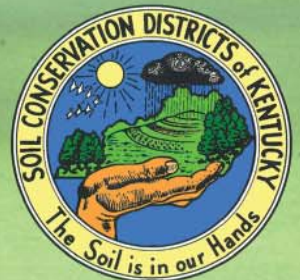


Working Trees: Kentucky's Renewable Future



www.kyfb.com



www.conservation.ky.gov

What is a tree

A **tree** is a woody plant that's usually more than 10 feet tall and has one main stem. Although trees come in different shapes and sizes, most have the same basic parts. Each of these parts, from the highest leaves in the crown to the tiny root hairs buried in the soil, plays an important role in the tree's function and survival.

The **crown** of the tree is made up of the leaves and branches.

The **cambium** is a layer or zone of cells, one cell thick, inside the inner bark. The cambium produces both the xylem and phloem cells. This is where diameter growth occurs and where rings and inner bark are formed.

The **trunk** of the tree supports the crown and serves as a highway for food made in the leaves to travel to the roots and for water and nutrients from the roots to travel to the leaves.

The **bark** layer protects the tree from insects and disease, excessive heat and cold and other injuries.

The **heartwood** of the tree develops as the tree gets older. It is old sapwood that provides the trunk with support and stiffness. In many kinds of trees, the heartwood is darker color than the sapwood, since its water-carrying tubes get clogged up.

In the **xylem** (sapwood) layer, tree sap (water plus nitrogen and mineral nutrients) is carried back up from the roots to the leaves. Sapwood gives a tree its strength. In the **phloem** (inner bark) layer, sugar that's made in the leaves or needles is carried down to the branches, trunks and roots, where it's converted into the food (starch) the tree needs for growth.

The **roots** of the tree support the trunk and crown and also anchor the tree in the soil. They serve as a storage facility during the winter for the food produced by the leaves during the growing season. The roots also absorb water and nutrients from the soil for use by the tree.

Parts of a Tree

Make a tree treat!

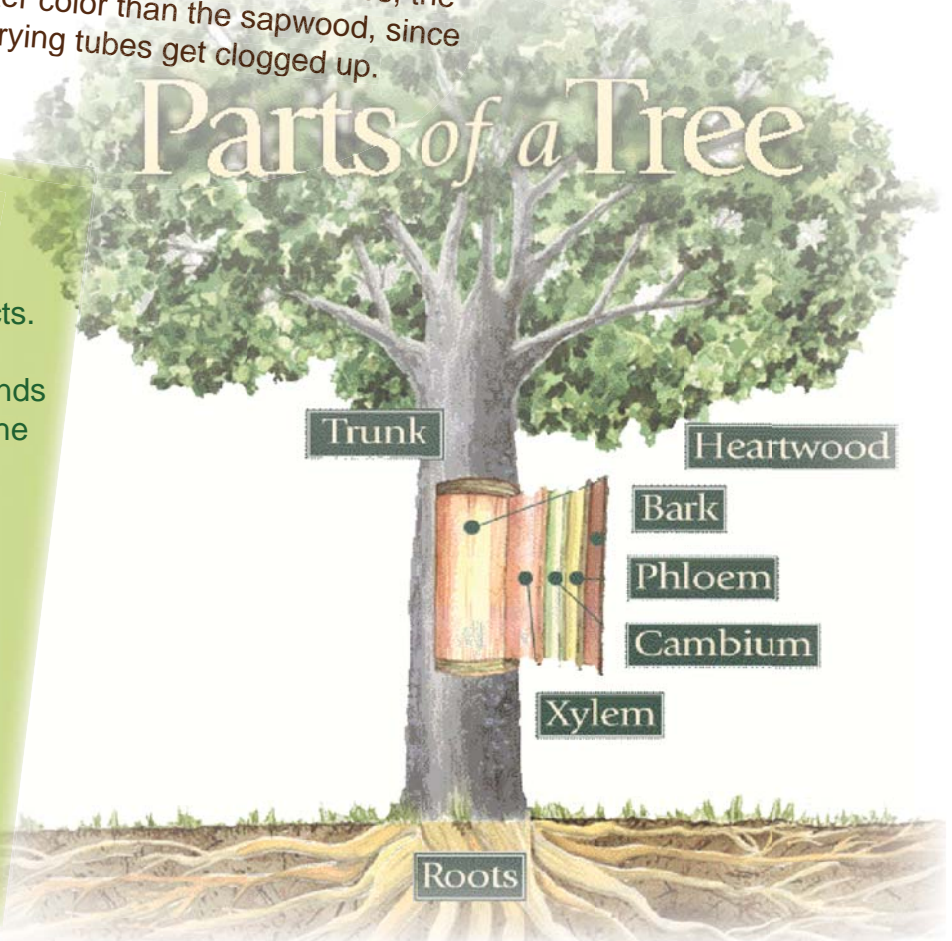
FUN

This recipe is made from wood products. Yes, ice cream has thickening agents made from trees. Fix one for your friends and see if they can guess what all of the ingredients have in common.

1 cup vanilla ice cream
 ¼ cup orange juice
 1 tsp. cinnamon
 ¼ cup almonds or pecans
 1 banana

Mix the ice cream, orange juice, cinnamon and banana in a blender.

Top with nuts for a tasty treat.



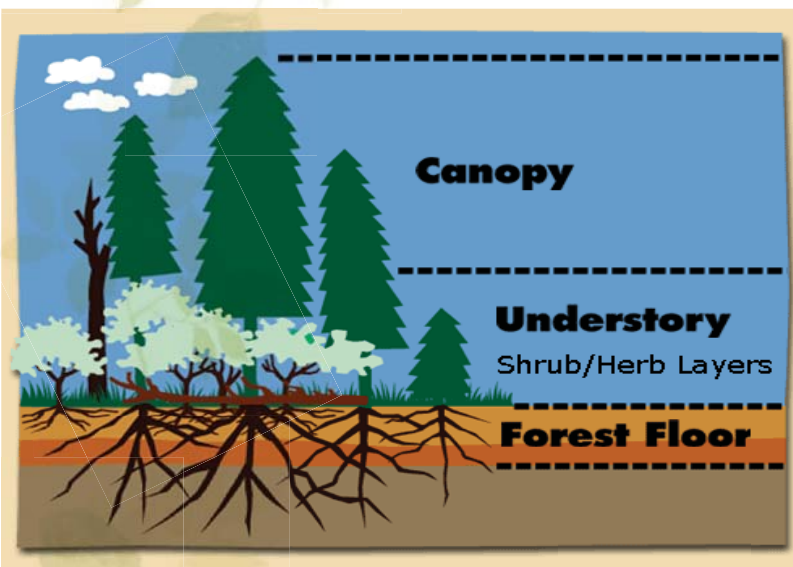
What is a Forest?



Forests protect fragile soils from erosion and purify water. They even improve air quality by reducing levels of carbon dioxide in the atmosphere.

Forests cover 47 percent of Kentucky's land area – some 11.9 million acres. They provide employment for more than 35,000 Kentuckians, and wood industries add an estimated \$8.5 billion to Kentucky's economy each year.

The forest is made up of a series of levels of life, arranged from the tops of the trees to the ground on which they grow. Each level constitutes a habitat where different species of plants and animals live. Altogether, the parts of the forest and the plants and the animals living in them make up the complex ecosystem we call, simply, a "forest."



The top level, called the **canopy**, is formed by the crowns – the leafy tops – of the tallest trees. This is where photosynthesis, using sunlight to manufacture food the tree can use, is carried on most actively. It's also the home of thousands of insects. These in turn attract thousands of insect-eating birds. Squirrels are also active in the canopy because seeds and nuts are plentiful there.

The next level is the **understory**. It's made up of small trees pushing upward toward the light. It has its own population of animals, birds and insects that find the feeding conditions to their liking.

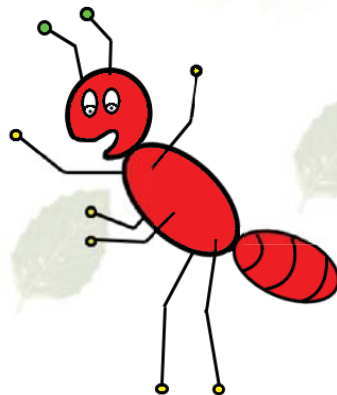
The next layer, considered part of the understory, is called the **shrub/herb layer** and is composed of many kinds of shrubs, low-lying wildflowers, grasses, ferns, mosses and vines, which offer still different nesting and feeding opportunities. This is the home of many of our

songbirds that rely on the berries and seeds of shrubs, and for mice, insects, snakes and toads.

The lowest layer is the **forest floor**, where leaves, twigs, branches and whole trees accumulate. They are eventually transformed into humus – a rich, absorbent, black or brown layer of soil – by the effects of weather and the activities of fungi, millipedes, ants and other insects.

Tree Trivia

There are 11.9 million acres of forestland in Kentucky, blanketing nearly half of the Commonwealth. Nearly 90 percent of Kentucky's forestland is privately owned.



Volunteer to plant trees

FUN

Volunteers play an important part in tree planting and tree care projects in communities across the United States.

They work in partnership with city officials, schools, businesses, and other citizens to transform our urban landscapes.

Whether you are participating in planting trees with your neighborhood association or assisting with a tree pruning project city-wide, volunteering to beautify your community can be very fulfilling.

So volunteer yourself or convince your club, class or friends to help. For more information, visit these websites:

<http://www.arboday.org/programs/volunteers/index.cfm>
<http://www.forestry.ky.gov>

Leaves & Roots

FOR WATER QUALITY



To improve the quality of our water in Kentucky, both the visible and the unseen parts of our trees and forests play important roles. Both the leaves and the roots of trees in a forest help contribute to water quality in several ways.

Leaves

Leaves on a tree form a canopy and are important to water quality in many ways. One function of leaves is that they provide a source of food and habitat for aquatic macroinvertebrates (the very small life stage of insects that live under water), fish and other wildlife associated with aquatic ecosystems. Leaves also shade the canopy (top leafy part of trees), keeping water temperatures cooler and maintaining more consistent oxygen levels than in streams exposed to constant sunlight. With lower levels of oxygen and fluctuations in levels between night and day, aquatic life becomes stressed and there are often large die-offs. Both the improved oxygen levels and the root systems that often extend into the streams, along with fallen branches, improve habitat conditions for aquatic organisms such as fish, frogs and the creatures they feed on. Leaves also help to cushion the fall of stormwater and prevent it from eroding the soil. As the leaves fall to the ground, they form a layer that helps to slow water movement and also filter the water. Nutrients, sediment and pollutants carried by stormwater are captured by the leaves and humus (decaying organic matter) on the forest floor. The nutrients that could over-fertilize streams, causing excessive algae growth, are instead used for tree growth.

FUN

Start an arboretum on your school grounds.

Starting and maintaining an arboretum is an outstanding class project that will beautify your school and provide a learning experience for many generations of students. Contact the Kentucky Division of Forestry or your county extension agent for help in planning an arboretum at your school.

Tree Trivia

The air under the canopy of a young, healthy tree may be as much as 20 degrees cooler than in the sunlight – a net cooling effect equivalent to 10 room-sized air conditioners operating 20 hours a day.

An extensive network of roots along a stream bank increases water quality in many ways. The root system provides habitat and food for aquatic organisms. Select macroinvertebrate species will make modified homes out of root fragments and often live attached to the roots. Small fish also use the roots as a place to hide and escape larger predators. The network of roots holds the soil of the stream bank in place, and prevents erosion that would deposit sediment into the stream. The roots also slow water movement, preventing soil erosion and reducing the risks of bank slumping or shifting into the streams.

In addition to slowing down the stream's flow, roots also absorb water, helping to reduce downstream flooding. They improve the rates at which water is able to seep into the ground and into groundwater. The groundwater helps to supply water to streams in times of low rainfall.

Roots

Forest Management FOR WATER QUALITY

Different silvicultural (relating to the cultivation of forests for wood and other tree products) activities have the potential to cause nonpoint (not traceable to a specific location) source pollution in streams. These include sediments, nutrients, organic debris and thermal pollution. Stream flow can also be affected.

Sediments

Sediments are the most common pollutant resulting from silvicultural activities. When it settles, sediment covers lake bottoms or streambeds. This can eliminate essential habitat, covering food sources and spawning sites and smothering bottom-dwelling organisms. Sediment deposition reduces the capacity of stream channels to carry water and of reservoirs to hold water. This decreased flow and storage capacity can lead to increased flooding and decreased water supplies. Suspended sediments increase water turbidity (muddiness), limiting the depth to which light can penetrate and adversely affecting the ability of aquatic vegetation to perform photosynthesis. Suspended sediments can also damage the gills of some aquatic organisms including aquatic insects, crayfish, mussels and fish, causing them to suffocate. It might also limit the ability of sight-feeding fish to find food and stop reproduction in mussels.

Turbid waters tend to have higher temperatures and lower dissolved oxygen concentrations. A decrease in dissolved oxygen levels can kill aquatic organisms including fish and macroinvertebrates living on the bottom of the stream. Sediments principally result from erosion of the soil but can also include organic matter. The primary source of excessive sediments during silvicultural operations is disturbed bare ground from road construction, timber harvesting and site preparation for reforestation.

Most detrimental effects of harvesting are related to the movement of vehicles and machinery and the skidding (dragging along the ground) and loading of trees or logs. These effects include soil disturbance, soil compaction (packing down) and direct disturbance of stream channels. Mechanical site preparation by large tractors that shear, disk, drum-chop or root-rake a site results in soil disturbance over large areas and has a high potential to harm water quality. Site preparation techniques that result in the removal of aquatic vegetation and litter cover, soil compaction, exposure or disturbance of the soil and increased streamflows due to decreased infiltration all can contribute to increases in stream sediment loads.

Nutrients

Nutrients generally originate from the application of fertilizers. In Kentucky, silvicultural use of fertilizers is limited and excessive nutrients aren't often a product of silvicultural activities.

Organic Debris

Tree limbs, tree tops and other waste materials are the principal organic pollutants from silviculture. These materials are often directly pushed or felled into streams or wash into them during storms. Organic debris can cause downstream flooding.

Thermal Pollution

Thermal pollution is an increase in water temperature to a point at which some aquatic organisms can't survive. Removal of the canopy cover along streams causes water temperature to rise.

Streamflow

Removal of vegetation can result in a temporary increase in streamflow. The amount of streamflow increases as more vegetation is removed. This increase can result in the erosion of the stream bank and scouring (washing away) of the stream bed.